REMARKS

Claims 1-6 and 8-18 are currently pending in the above-identified patent application.

In the Office Action dated January 09, 2009, the Examiner rejected claims 1-6 and 8-18 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,724,539 (hereinafter Riggle et al.) in view of U.S. Patent No. 6,915,380 (hereinafter Tanaka et al.) since, as per claim 1, the Examiner stated that Riggle et al. teaches a method comprising addressing a plurality of data strips from data to a chosen disk of a plurality of disk drives (Col. 3 lines 6-10; Col. 6, Lines 28-31) such that the throughput of each of the plurality of disk drives is maximized (Col. 5, Lines 26-31); forming a data stream comprising data strips (FIG. 1 Item 90), the data stream having a first throughput (Col. 5, Lines 5-8 and 13-17); creating a plurality of parallel data streams (FIG. 1, Item 110), each of the plurality of parallel data streams having an equal second throughput (Col 5, Lines 5-8 and 13-17; Col. 7, Lines 16-19), the second throughput being smaller than the first throughput (Col. 5, Lines 5-8 and 13-17); directing the plurality of parallel data streams to a corresponding plurality of the plurality of disk drives (FIG. 1, Item 150; Col. 6, Lines 28-31) such that each data strip in the plurality of data strips is transmitted to the chosen disk of the plurality of disk drives (Col. 6, Lines 31-34); and storing each of the data strips on each of the plurality of disk drives (Col. 6, Lines 31-34).

The Examiner continued that Riggle et al. does not teach using a crossbar switch to direct the data streams; however, Tanaka et al. teaches using a crossbar switch (Tanaka et al.; FIG. 1, Item "SW1;" FIG. 2, Item "XSW;" Col. 6, Lines 35-46) to direct data streams in a data storage system which divides high bandwidth input stream into equal lower bandwidth output streams (Tanaka et al.; Col. 9, Lines 13-28). The Examiner then concluded that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the teachings of Riggle et al. to include the crossbar switch because doing so allows for throughput between the disk adapter and the disk array to be improved (Tanaka et al.; Col. 9, Lines 37-38).

As per claims 9 and 14, the Examiner asserted that Riggle et al. teaches a system comprising a plurality of disk drives (FIG. 1, Item 150) each having a communication channel (FIG. 1, Item 140) capable of communicating at a first throughput (Col. 5, Lines 5-8 and 13-17); a controller (FIG. 1, Item 40) adapted to address a plurality of data strips from the data to a chosen disk of the plurality of disk drives (Col. 3 Lines 6-10; Col. 6, Lines 28-31) such that the throughput of each of the plurality of disk drives is maximized (Col. 5, Lines 26-31), and from a data stream comprising the data strips, the data stream having a second throughput (Col. 5, Lines 5-8 and 13-17); a buffered switch (FIG. 1, Item 50) in communication with the controller adapted to create a plurality of parallel data streams (Col. 6, Lines 28-31), each of the plurality of parallel data streams having the second throughput, the first throughput being smaller than the second throughput (Col. 5, Lines 5-8 and 13-17); a switch (FIG. 1, Item 100) in communication with the buffered switch and adapted to direct the plurality of parallel data streams to the plurality of disk drives such that each of the separate data strips are transmitted to each of the plurality of disk drives to which the separate data strips are addressed (Col. 6, Lines 31-40); and wherein the plurality of disk drives are adapted to receive the plurality of parallel data streams and store the data strips on the disk drives (Col. 6, Lines 31-34).

The Examiner continued that Riggle et al. does not teach wherein the switch is a crossbar switch used to direct the data streams, but that Tanaka et al. teaches using a crossbar switch (Tanaka et al.; FIG. 1, Item "SW1;" FIG. 2, Item "XSW;" and Col 6 Lines 35-46) to direct data streams in a data storage system which divides high bandwidth input stream into equal lower bandwidth output streams (Tanaka et al.; Col. 9, Lines 13-28), and concluded that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the teachings of Riggle et al. to include the crossbar switch because doing so allows for throughput between the disk adapter and the disk array to be improved (Tanaka et al.; Col. 9, Lines 37-38).

Applicant respectfully disagrees with the Examiner's rejection of claims 1-6, and 8-19 under 35 U.S.C. 103(a) as being unpatentable over Riggle et al. in

view of Tanaka et al. for the reasons to be set forth hereinbelow. Reexamination and reconsideration are requested.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). For the reasons to be set forth hereinbelow, applicant believes that independent claims 1, 9 and 14 are patentable over the combination of Riggle et al. with Tanaka et al. Therefore, dependent claims 2-6, 8, 10-13, and 15-18, which depend therefrom, respectively, are patentable, and applicant believes that no further response is necessary regarding these claims.

Turning now to Riggle et al., Col. 5, lines 24-41, state: "One of the main objectives of grouping disk drives into an array is to meet the demands for a higher storage subsystem bandwidth. **To provide the bandwidth increase in an economically feasible manner the subsystem resources must be used at their optimal capacity levels.** If the storage subsystem bandwidth is configured to accommodate the highest transfer rate, the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface. Hence a sufficiently large sample transfer unit will span a range of track bands from the disk drives involved. The implication is that the array of disk drives will tend to transfer at an average aggregate bandwidth over a statistically large number of transfers. Having an over-configured subsystem bandwidth is thus undesirable because it results in inefficient and costly resource use of the serial subsystem elements such as the controller buffer shared among the disk drives in the array and the computer host interface bus." (Emphasis added by applicant.).

Clearly, Riggle et al. teaches away from configuring the storage subsystem bandwidth to accommodate the highest transfer rate since the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface.

Column 7, lines 4-32, of Riggle et al. state further: "It is possible to format each disk surface 170 of a disk drive 120 to have a constant number of sectors on every track, as shown in FIG. 3. With sector boundaries 180 aligned radially

throughout the disk surface 170, each sector 190 is traversed by the read/write head 200 mounted on a positioner 210 and associated with the disk surface in the same period of time. Hence, the same amount of data, such as a 512 byte block, can be written to each track within every sector 190. This uniform sector format of disk surface 170 with the same number of data bits stored between any two consecutive sector boundaries 180 leads to a constant data transfer rate from any track regardless of its radius. If a transfer unit is distributed among a stripe set of disk drives 130, all the drives can participate in the data movement simultaneously. In the ideal case of a fully parallel transfer the aggregate device bandwidth is thus equal to the individual disk drive bandwidth times the number of drives in the stripe set. However, the uniform sector format of FIG. 3 results in poor utilization of magnetic media storage capacity. Since the length of the track segment bounded by the adjacent sector boundaries 190 increases with track radius, the linear bit density on the outer tracks is lower than that on the shorter inner tracks. An effective way to prevent loss of useful storage capacity is to divide the disk surface into a number of bands of neighboring tracks. As is depicted in a simplified diagram of FIG. 4, each track band is formatted, for example, to have the same number of sectors, each sector defining the length of a track segment needed to store a block of data. An ever greater number of sectors is written on the outer bands in order to maintain a more nearly constant linear bit density throughout the disk surface. As a disk 220 is rotated at a constant angular velocity, however, the linear velocity of the tracks moving past read/write head 200 increases in direct proportion to the track radius. Since the intent of track banding is to produce a uniform linear bit density on every track, the number of data bits encountered by read/write head per unit time grows linearly with its velocity and, therefore, disk radius. Hence, the data transfer rate with read/write head 200 positioned over a track in an inner band 230 is the lowest, increasing for tracks in a middle band 240, and reaching its maximum for transfers involving tracks located in an outer band 250." (Emphasis added by applicant.).

Claim 1 of Riggle et al. recites in part: "... **each track requiring a different track data transfer rate**, the tracks being so selected that a sum of the data transfer rates is substantially equal to the bandwidth of the communication channel; ... ."

Thus, Riggle et al. teaches away from equal data transfer rates to each disk drive since the uniform sector format of FIG. 3 thereof results in **poor utilization** of magnetic media storage capacity.

Subject claim 1 recites in part: "...addressing a plurality of data strips from said data to a chosen disk of said plurality of disk drives such that the throughput of each of said plurality of disk drives is maximized; forming a data stream comprising said data strips, said data stream having a first throughput; creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput ... ." (Emphasis added by applicant.). Similar language may be found in independent claims 9 and 14.

Subject independent claims 1, 9 and 14 recite maximizing the throughput of each of said plurality of disk drives. Riggle et al. does not teach this limitation. Rather, Riggle et al. teaches away from this condition by stating that the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface.

In re Gurley, 27 F.3d 551, 31 USPQ2d 1130 (Fed. Cir. 1994), states on page 1131 that: "... A reference may be said to teach away **when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant**. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by applicant. ... ." (Emphasis added by applicant.). The teaching of Riggle et al. is clearly that different individual disk drive bandwidth times are desired if poor utilization of magnetic media storage capacity is to be avoided. Article 2141.02,

Differences Between Prior Art and Claimed Invention of the Manual Of Patent Examining Procedure, Section VI requires that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983).

The Court in *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004) stated: "Appellants quote language from In re Gurley that '[a] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." 27 F.3d at 553. Appellants argue that "the prior art disclosed alternatives to each of the claimed elements A [the perimeter], B [the shape of the surface], and C [the orientation of the surface]. Choosing one alternative necessarily means rejecting the other, i.e., following a path that is 'in a divergent direction from the path taken by applicant.' This interpretation of our case law fails. **The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the '198 application**. Indeed, in the case cited by appellants, In re Gurley, we held that the invention claimed in the patent application was unpatentable based primarily on a prior art reference that disclosed two alternatives, one of which was the claimed alternative. Accordingly mere disclosure of alternative designs does not teach away." (Emphasis added by applicant.).

Clearly, Riggle et al. does not teach configuring the storage subsystem bandwidth to accommodate the highest transfer rate since, according to Riggle et al., the bandwidth capacity is underutilized on average because for full storage capacity utilization, data must be placed on all available tracks on the disk surface. Riggle et al. teaches further that to provide bandwidth increase in an economically feasible manner, the subsystem resources must be used at their optimal capacity levels. Nor does Riggle et al. teach that each of the data

streams has equal throughput. Riggle et al. clearly **criticizes, discredits, or otherwise discourages the solution claimed** in the subject claims, that of configuring the storage subsystem bandwidth to accommodate the highest transfer rate.

The Title of the Riggle et al. patent is "System For Selectively Storing Stripes Of Data In Tracks Of Disks So That Sum Of Transfer Rates Of Stripes Match Communication Bandwidth To Host". Moreover, as stated hereinabove, Riggle et al. recites: "One of the main objectives of grouping disk drives into an array is to meet the demands for a higher storage subsystem bandwidth. **To provide the bandwidth increase in an economically feasible manner the subsystem resources MUST BE USED at their optimal capacity levels."** (Emphasis added by applicant.). The invention of Riggle et al. is clearly to provide a higher storage subsystem bandwidth. In order to do so, Riggle et al. teaches that the subsystem resources must be used at their optimal capacity levels. The use of the language "must be used" does not permit the language: "If the storage subsystem bandwidth is configured to accommodate the highest transfer rate, the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface." as part of the invention.

Therefore, applicant respectfully believes that upon reading Riddle et al. reference, one having ordinary skill would be discouraged from following this path and would be led in a direction divergent from the path taken by applicant. Riddle et al. thus teaches away from the present claimed invention. Tanaka et al. does not change this conclusion.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Clearly, Riggle et al. does not disclose configuring the storage subsystem bandwidth to accommodate the highest transfer rate as an alternative design. Nor does Riggle et al. teach that

each of the data streams has equal throughput. Therefore, applicant respectfully believes that the Examiner has not established a *prima facie* case of obviousness as is required under 35 U.S.C. 103.

Tanaka et al. in Col. 6, lines 35-46, states: "As shown in FIG. 2, the switch SW**1** includes a crossbar switch XSW and a switch controller CTL. The crossbar switch XSW is of 5x5 and includes input ports in**1**, in**2**, in**3**, in**4** and in**5** and output ports out**1**, out**2**, out**3**, out**4** and out**5**. **The frame inputted from the port P1** is supplied through a serial-to-parallel converter SP**1**, a buffer memory BM**1** and an 8B10B encoder DEC**1** to the switch controller CTL and the input port in**1**. **The switch controller CTL decodes a destination address written in a header portion of the input frame and changes over the crossbar switch XSW**." (Emphasis added by applicant). Subject claim 1 recites in part: "... creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput; directing **said plurality of parallel data streams** to a corresponding plurality of said plurality of disk drives using a crossbar switch ... ." (Emphasis added by applicant.). The use of the crossbar switch in Tanaka et al. therefore teaches away from subject claim 1 in that a single frame is input to the crossbar switch of Tanaka et al., whereas a plurality of parallel data streams is directed to appropriate disk drives by the crossbar switch of subject claim 1. Similar recitations may be located in subject independent claims 9 and 14.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Further, a prior art reference that 'teaches away' from the claimed invention is a significant factor to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 32

USPQ2d 110, 1132 (Fed. Cir. 1994). Applicant believes that Tanaka et al. teaches away from the present claimed invention in the use of the crossbar switch therein.

In view of the discussion presented hereinabove, applicant believes that subject claims 1-6 and 8-18 are in condition for allowance or appeal, the former action by the Examiner at an early date being earnestly solicited.

Reexamination and reconsideration are respectfully requested.

Respectfully submitted,

COCHRAN FREUND & YOUNG LLC

Date: May 11, 2009

By: _____

Samuel M. Freund
Reg. No. 30,459
2026 Caribou Drive, Suite 201
Fort Collins, Colorado 80525
Phone: (970) 492-1100
Fax: (970) 492-1101
Customer No.: 27479